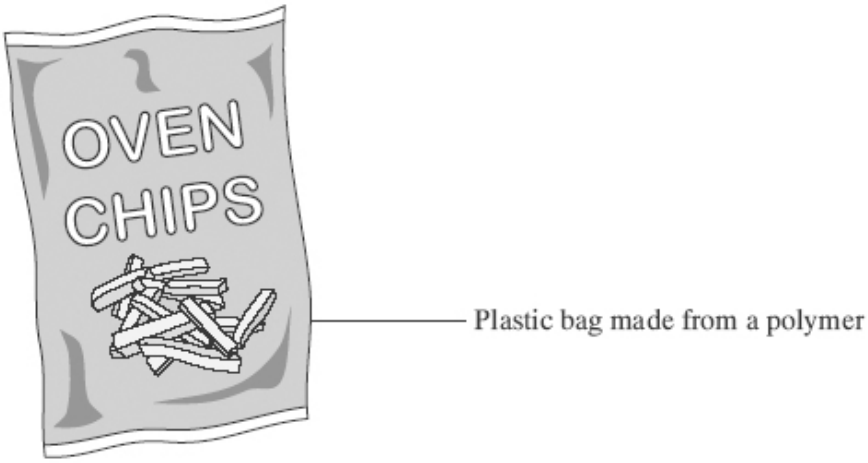
Q1. Polymers are used to make many materials that people need.

(a) Plastic bags are used to carry, protect and store food. Plastic bags are made from polymers.



(i) Ethene is the small molecule (the monomer) used to make the polymer for this plastic bag.

Name the polymer that is made from ethene.

.....

(1)

(ii) Use the correct word from the box to complete the sentence about ethene.

condensing	**corroding**	**cracking**

Ethene is made by breaking down large hydrocarbon molecules into smaller hydrocarbon molecules by a process called .....

(1)

(iii) The hydrocarbon ethene has the formula C_2H_4

Complete the sentence about ethene.

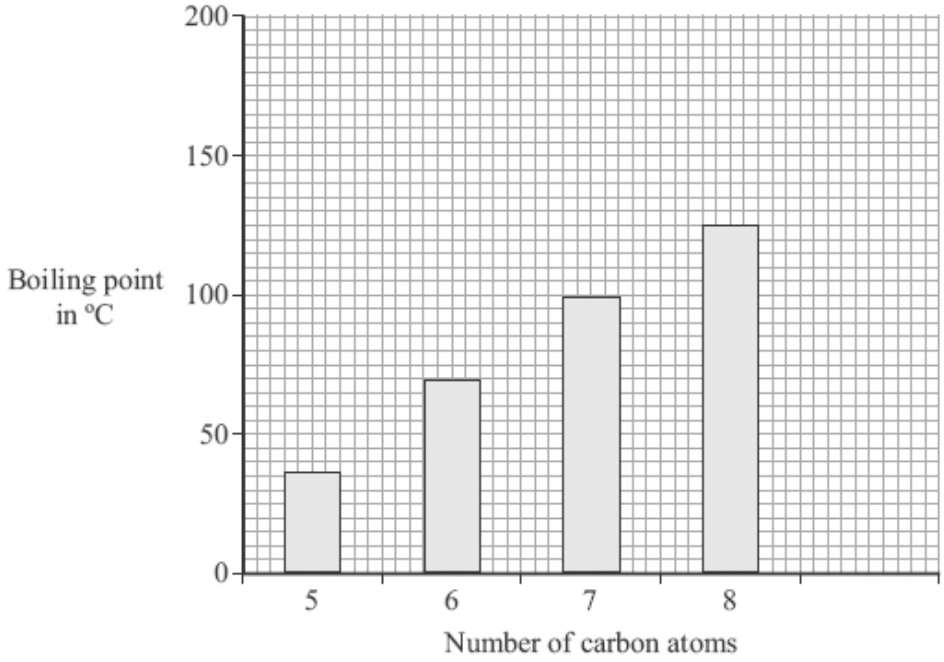
Ethene is a hydrocarbon made up of carbon and ..... atoms.

(1)

(b) The hydrocarbons used to make ethene come from crude oil. The properties of hydrocarbons are linked to the number of carbon atoms in their molecules.

Number of carbon atoms	5	6	7	8	9
Boiling point in °C	36	69	99	125	151

(i) Use the data in the table to complete the bar chart.



(2)

(ii) What happens to the boiling point of a hydrocarbon as the number of carbon atoms increases?

.....

(1)

(iii) All the hydrocarbons in the table are found in petrol. Petrol is one of the fractions separated from crude oil.

Describe how the fractions are separated from crude oil.

.....

.....

.....

.....

.....

(2)

(c) Most plastic bags that are made of hydrocarbons are not biodegradable.

Used plastic bags can be:

- dumped into large holes, which is called landfill
- burned to give out heat energy, which would produce large amounts of gases.

Would burning used plastic bags be better for the environment than dumping them in landfill?

Explain your answer.

.....

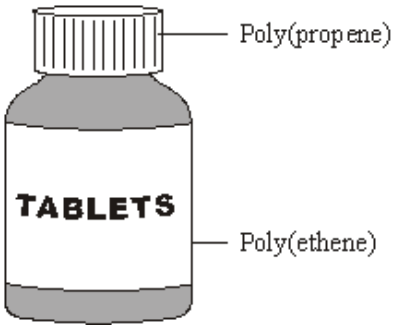
.....

.....

.....

(2)
(Total 10 marks)

Q2. Tablet containers are often made from two different polymers.



(a) Ethene, C_2H_4, and propene, C_3H_6, can be made from crude oil.

(i) Complete the following sentence.

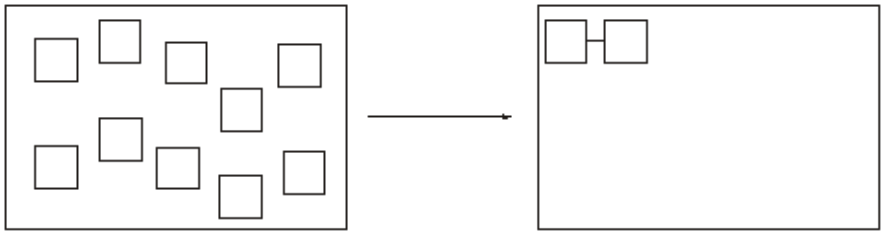
Ethene and propene are called hydrocarbons because they are made up of carbon and ..... atoms only.

(1)

(ii) Ethene molecules are used to form poly(ethene) molecules.

Complete the diagram to show the poly(ethene) molecule.

Ethene molecules **Poly(ethene) molecule**



(2)

(b) The tablet containers could be disposed of in a landfill site or could be recycled.

(i) Suggest **two** reasons why disposing of the tablet containers in a landfill site could cause problems.

1 .....

.....

2 .....

.....

(2)

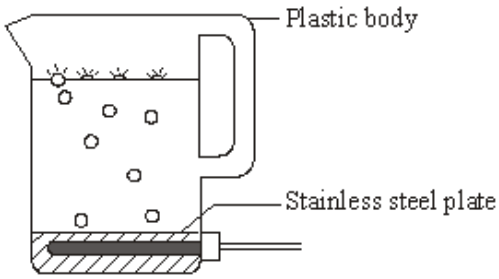
(ii) Suggest **one** reason why recycling the tablet containers would be difficult.

.....

.....

(1)
(Total 6 marks)

Q3. Plastics are used to make many everyday items, such as the body of the kettle.



(a) Complete the sentences by drawing a ring around the correct words.

(i) The plastic is made from many small molecules called

catalysts
monomers
polymers

(1)

(ii) Propene is produced by cracking some of the fractions that are

separated from

crude oil
limestone
metal ores

(1)

(b) After a few years the kettle no longer worked.

- Some parts of the kettle are made of plastic.
- Some parts of the kettle are made of stainless steel.
- The owner of the kettle disposed of it in a landfill site.

Consider these statements.

Suggest **three** reasons why the kettle should **not** be disposed of in a landfill site.

1 .....

.....

2 .....

.....

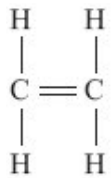
3 .....

.....

(3)
(Total 5 marks)

Q4. Crude oil is used to make useful substances such as alkenes and plastics.

(a) The alkene shown is ethene.



(i) Tick (✓) the correct formula for ethene.

Formula	(✓)
CH_4	
C_2H_4	
C_2H_6	

(1)

(ii) Tick (✓) the name of the plastic formed when many ethene molecules join together.

Name of plastic	(✓)
Poly(ethene)	
Poly(ethanol)	
Poly(propene)	

(1)

(b) Read the article about plastics and then answer the questions.

THE PROBLEM WITH PLASTIC WASTE

The UK produces about 3 million tonnes of plastics from crude oil every year.
Most of the litter found on UK beaches is plastic waste.
80% of the plastics produced end up in landfill sites.
The UK recycles only 7% of plastic waste.

(i) Draw a ring around the correct answer in the box to complete the sentence.

Litter that is plastic waste needs to be removed from beaches

because it

decomposes
is flammable
is not biodegradable

.

(1)

(ii) Suggest a problem caused by 80% of the plastics going to landfill sites.

.....

.....

(1)

(iii) The UK government has set a target to recycle 30% of plastic waste.

How are resources saved by recycling more plastics?

.....

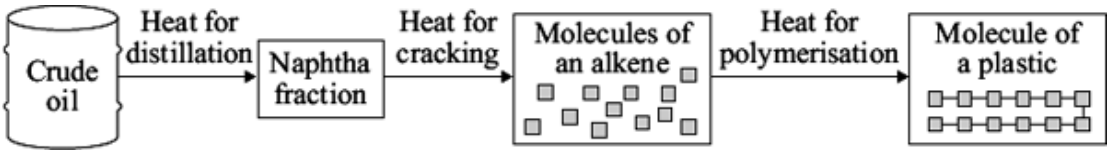
.....

(1)

(Total 5 marks)

Q5. Crude oil is used to make plastics.

(a) To make a plastic from crude oil involves many processes.



(i) How do alkene molecules form a molecule of a plastic?

.....

.....

(1)

(ii) Suggest **one** of the main costs of making a plastic from crude oil.

.....

.....

(1)

(iii) Suggest **two** problems caused by the disposal of plastics in landfill sites.

1 .....

.....

2 .....

.....

(2)

(b) Some companies are using bio-plastics made from plants such as corn.
Less fossil fuel is used to make bio-plastics than is used to make plastics from crude oil.

Plastics made from plants would be more environmentally friendly than plastics made from crude oil.

Explain why.

.....

.....

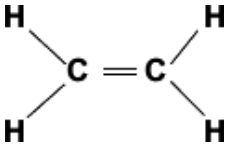
.....

.....

(2)
(Total 6 marks)

Q6. Supermarkets in the UK have been advised by the Government to stop giving plastic bags to customers.
Plastic bags are made from a polymer.
The polymer is made from ethene.

The structural formula of ethene is shown.



Ethene is made by cracking hydrocarbons.
These hydrocarbons come from crude oil.

(a) Complete these sentences about ethene.

(i) Ethene is a hydrocarbon because it contains only ..... and

.....

(2)

(ii) Ethene is unsaturated because it has a ..... bond.

(1)

(b) Tick (✓) the name of the polymer formed when many ethene molecules join together.

Name of polymer	**Tick (✓)**
poly(chloroprene)	
poly(ethene)	
poly(propene)	

(1)

(c) Suggest **two** reasons why supermarkets should stop giving plastic bags to customers.

1 .....

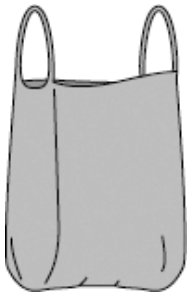
.....

2 .....

.....

(2)
(Total 6 marks)

Q7. The plastic used for shopping bags is made from crude oil.



(a) Complete each sentence.

(i) The compounds of hydrogen and carbon

in crude oil are called .....

(1)

(ii) Crude oil is separated into fractions, such as naphtha, using

fractional .....

(1)

(b) Plastics are made from alkenes.
The alkenes are made from naphtha.

Draw a ring around the correct answer to complete each sentence.

(i) First the liquid naphtha is made into a gas. This process is called

distilling.
filtering.
vaporising.

(1)

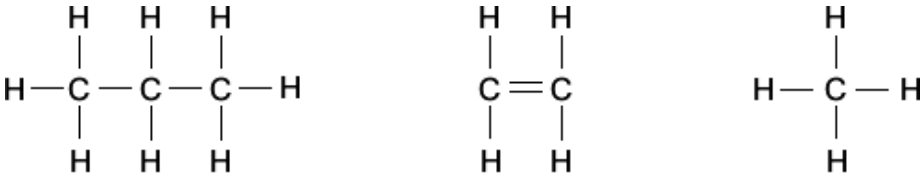
(ii) The naphtha gas is then passed over a hot catalyst.

This process is called

boiling.
bonding.
cracking.

(1)

(c) The displayed formulas of three molecules are:



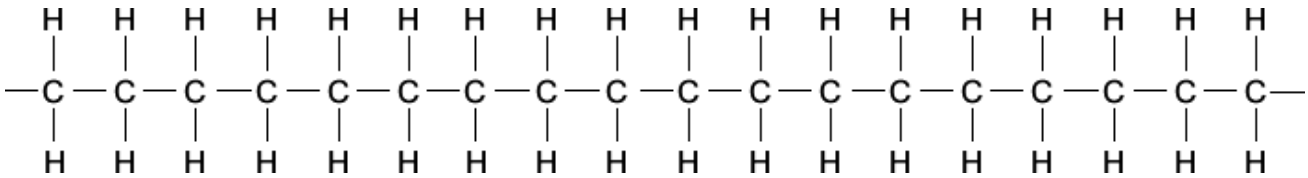
Molecule A **Molecule B** **Molecule C**

Which molecule, **A**, **B** or **C**, is an alkene? ☐

(1)

(d) The plastic for the bag is made when many alkene molecules are joined together to make the polymer called poly(ethene).

Part of a very large poly(ethene) molecule is shown below.



After plastic bags have been used for shopping, the bags can be reused, recycled, buried in landfill sites or burned.

(i) Reusing and recycling used plastic bags is good for the environment because this conserves crude oil.

Tick (✓) another reason why recycling used plastic bags is good for the environment.

Reason	Tick (✓)
energy is used to transport and melt the used plastic bags	
new plastic products are made from the used plastic bags	
new plastic bags made from crude oil are cheap to produce	

(ii) Complete the sentence.

One reason why burying used plastic bags in landfill sites is not good for the environment is that poly(ethene) .....

(1)

(iii) Some statements about burning used plastic bags are given below.

Tick (✓) **one** advantage and tick (✓) **one** disadvantage of burning used plastic bags.

	Advantage Tick (✓)	**Disadvantage Tick (✓)**
new plastic bags can be produced		
carbon dioxide is produced		
water is one of the products		
energy is released		

(2)
(Total 9 marks)

Q8. Ethanol (C_2H_5OH) can be made from ethene or from sugar.

(a) Complete the table which shows the number of atoms of each element in the formula of ethanol.

Use the Chemistry Data Sheet to help you to complete the table.

Element	**Symbol**	**Number of atoms in the formula C_2H_5OH**
Carbon	C	2
Hydrogen	H	.....
.....	O	1

(2)

(b) Ethene (C_2H_4) is produced when hydrocarbons are cracked.

(i) Tick (✓) **two** conditions needed to crack a hydrocarbon.

Condition	Tick (✓)
The presence of an emulsifier.	
Heating the hydrocarbon to a high temperature.	
Adding oxygen to the hydrocarbon.	
The presence of a catalyst.	

(2)

(ii) Draw the missing bonds to complete the displayed structure of ethene.

H H

C C

H H

(1)

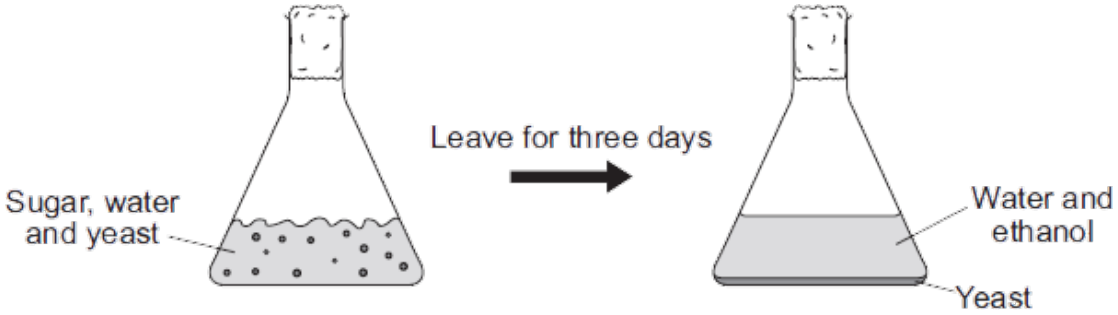
(iii) Name the substance added to ethene (C_2H_4) to produce ethanol (C_2H_5OH).

.....

(1)

(c) The diagram shows how a solution of ethanol is made from sugar dissolved in water.

The boiling point of ethanol is 78°C and the boiling point of water is 100°C.



(i) Name the gas produced during this reaction.

.....

(1)

(ii) What are the main steps needed to obtain pure ethanol from the mixture produced after three days?

.....

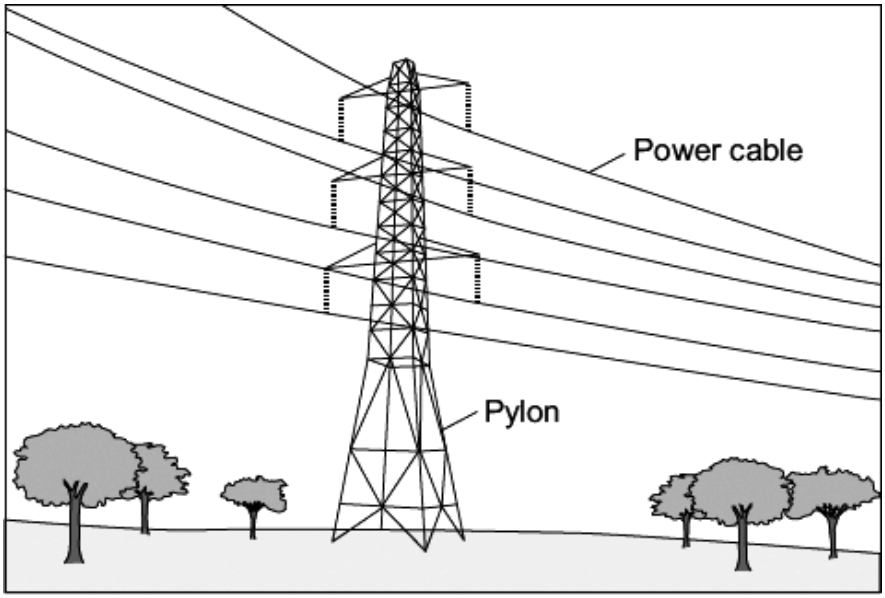
.....

.....

.....

(2)
(Total 9 marks)

Q9. Metals are used in the manufacture of pylons and overhead power cables.



(a) Suggest **one** reason why iron (steel) is used to make pylons.

.....

.....

(1)

(b) The table shows some of the properties of two metals.

Metal	Density in g per cm^3	Melting point in °C	Percentage(%) relative electrical conductivity	Percentage(%) abundance in Earth's crust
copper	8.92	1083	100	0.007
aluminium	2.70	660	60	8.1

Use the information in the table to suggest why aluminium and **not** copper is used to conduct electricity in overhead power cables.

.....

.....

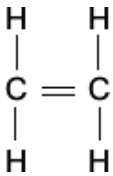
.....

.....

(2)

(c) A polymer can be used to cover and insulate power cables.

The polymer is made from the alkene:



Draw a ring around the correct answer to complete each of the sentences.

(i) The chemical formula of this alkene is

- CH
- CH_4
- C_2H_4

(1)

(ii) The two lines between the carbon atoms are called a

- double bond.
- nucleus.
- single bond.

(1)

(iii) The name of the polymer formed when many of these alkene molecules join together

is

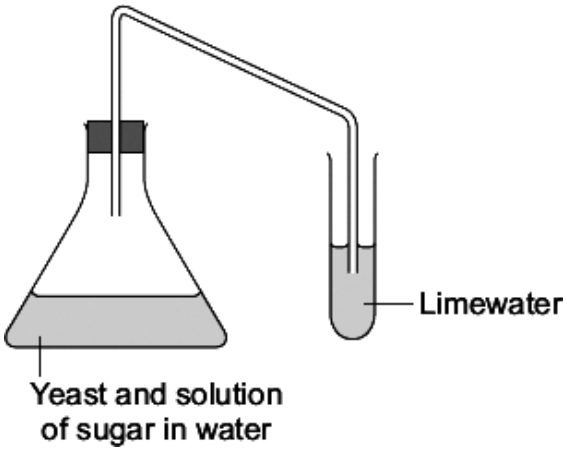
poly(ethene).
poly(ethenol).
poly(propene).

(1)
(Total 6 marks)

Q10. Two fuels that can be used for cars are:

- petrol from crude oil
- ethanol made from sugar in plants.

(a) A student used the apparatus shown to investigate the reaction to make ethanol from sugar.



(i) Draw a ring around the correct answer to complete the sentence

This reaction to make ethanol from sugar is

combustion.
decomposition.
fermentation.

(1)

(ii) Complete the sentences.

The limewater turns ..... .

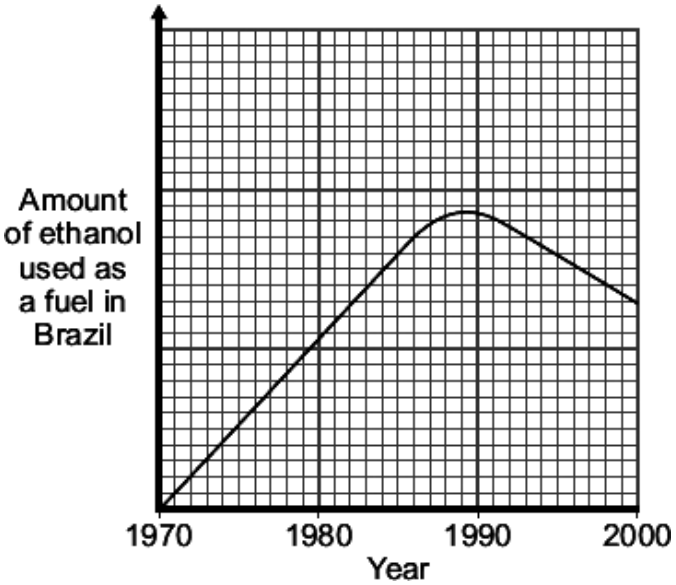
This happens because ..... .

(2)

(b) In 1970, the Brazilian Government stated that all petrol must contain more than 25% ethanol.

The reasons for this statement in 1970 were:
- Brazil did not have many oilfields
- Brazil has a climate suitable for growing sugar cane.

The graph shows the amount of ethanol used as a fuel in Brazil from 1970 to 2000.



(i) Use the graph to describe the changes in the amount of ethanol used as a fuel in Brazil from 1970 to 2000.

.....

.....

.....

.....

(2)

(ii) In 2011, the Brazilian Government decided to reduce the amount of ethanol in petrol to 18%.

Suggest **one** reason for their decision.

.....

.....

(1)
(Total 6 marks)

Q11. This question is about compounds produced from crude oil.

The table below shows four of these compounds.

Compound	Melting point in °C	Boiling point in °C
methane (CH_4)	−183	−164
ethene (C_2H_4)	−169	−104
decane ($C_{10}H_{22}$)	−30	+174
icosane ($C_{20}H_{42}$)	+37	+343

(a) Tick (✓) **two** correct statements about the four compounds.

Statement	Tick (✓)
Methane has the lowest melting point and icosane has the highest boiling point.	
Ethene and methane are alkanes.	
Methane and decane are gases at room temperature (20°C).	
Decane and icosane are liquid at 100°C.	

(2)

(b) Petrol contains a mixture of compounds, including octane (C_8H_{18}).

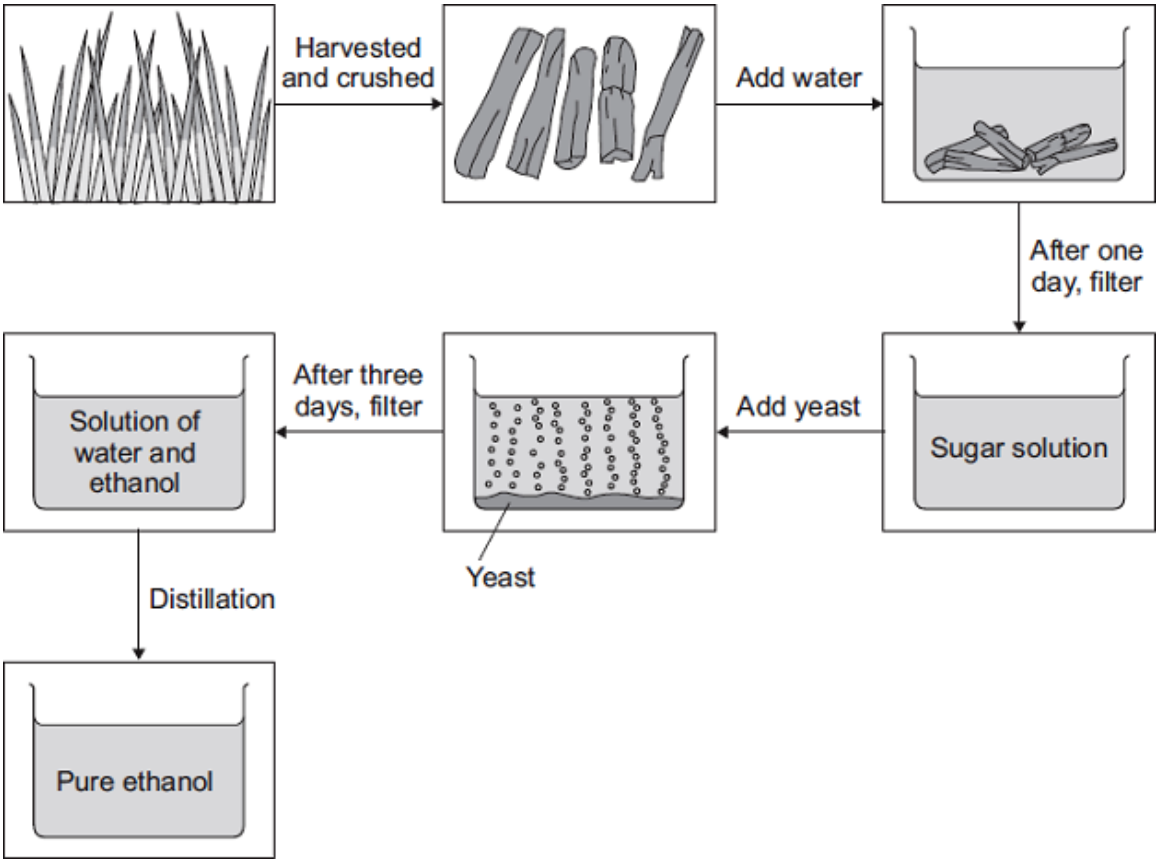
Complete the word equation for the complete combustion of octane.

octane + oxygen → ..... + ...

(2)

(c) Most petrol used in cars contains about 5% ethanol (C_2H_5OH).

Ethanol can be produced from sugar cane.



(i) Draw a ring around the correct answer to complete the sentence.

The reaction to produce ethanol from sugar solution is

combustion.
displacement.
fermentation.

(1)

(ii) Some people say that increasing the production of ethanol from sugar cane will be **good** for the environment.

Suggest **two** reasons why.

1 .....

.....

.....

2 .....

.....

.....

(2)

(iii) Other people say that increasing the production of ethanol from sugar cane will be **bad** for the environment.

Suggest **two** reasons why.

1 .....

.....

.....

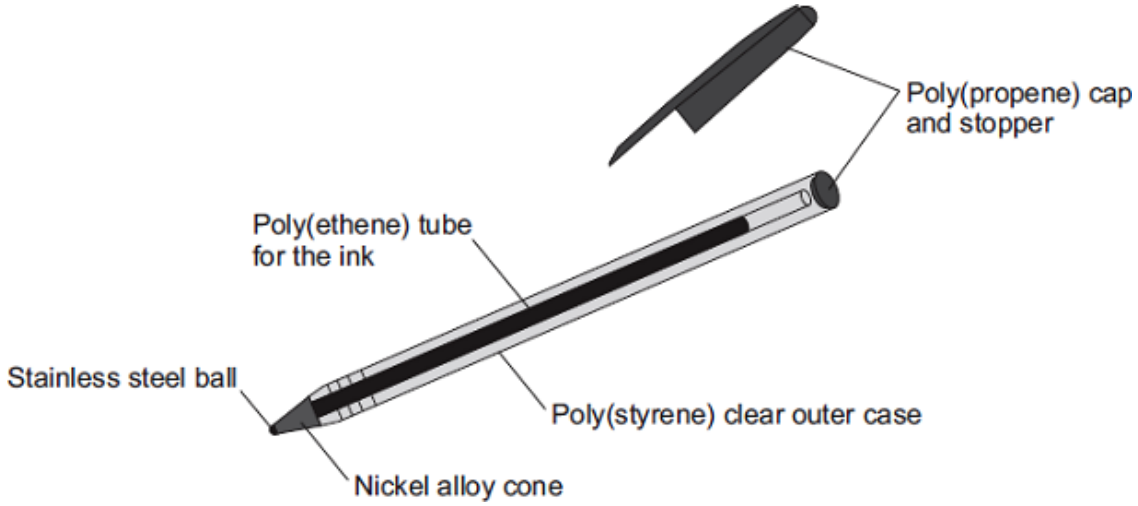
2 .....

.....

.....

(2)
(Total 9 marks)

Q12. The diagram shows a ballpoint pen.



(a) Polymers are used to make the ballpoint pen.

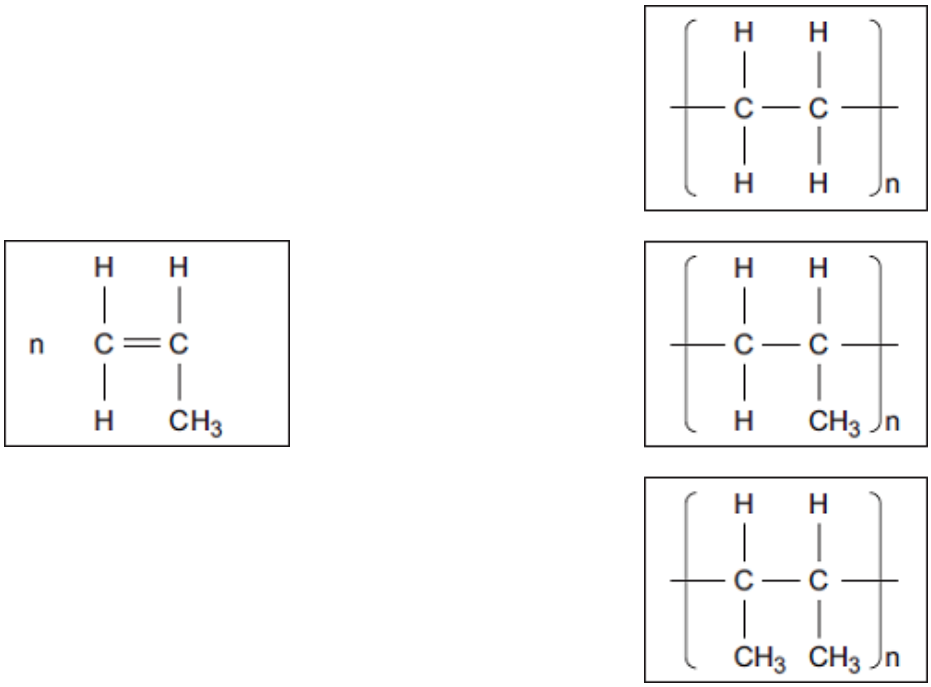
(i) Name the monomer used to make poly(ethene).

.....

(1)

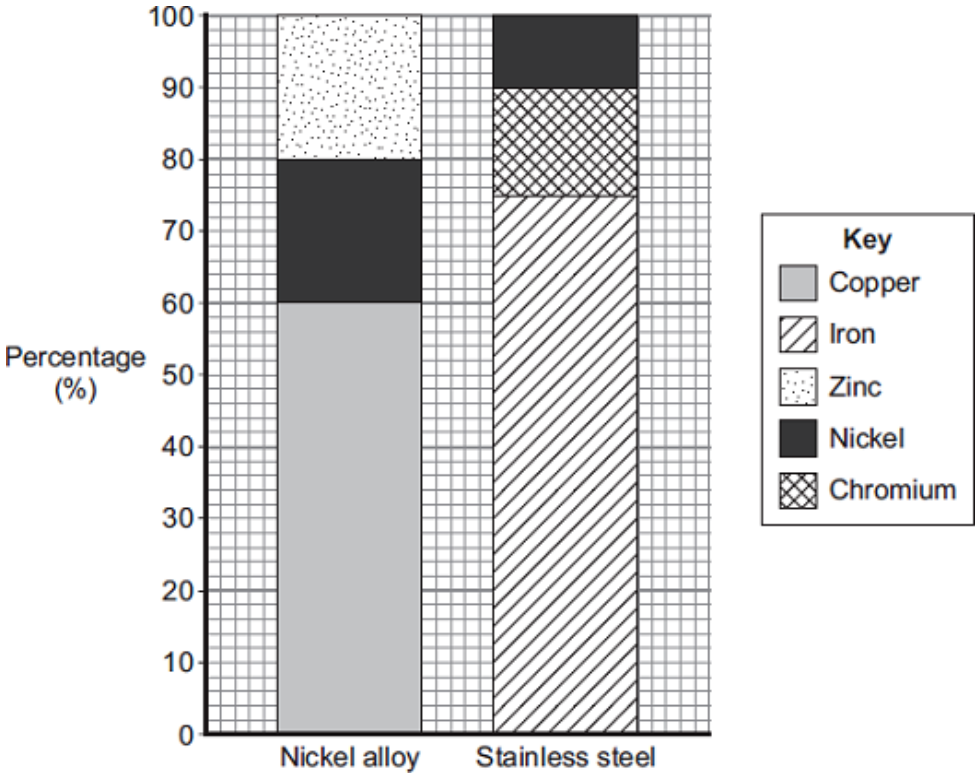
(ii) Draw **one** line from the monomer propene to its polymer poly(propene).

Monomer **Polymer**



(1)

(b) Two alloys are used to make the ballpoint pen.



Use the bar chart to answer these questions.

(i) Which metal is in both of these alloys? .....

(1)

(ii) What is the percentage of iron in the stainless steel? ..... %

(1)

(iii) The alloy stainless steel is used instead of pure iron for the ball of the pen.

Give **two** reasons why.

.....

.....

.....

.....

(2)

(c) Tick (✓) **one** advantage and tick (✓) **one** disadvantage of **recycling** this type of ballpoint pen.

	Advantage Tick (✓)	**Disadvantage Tick (✓)**
Can be refilled and reused		
Conserves resources of crude oil and ores		
High cost of separating materials		
Polymers and alloys are not expensive		

(2)
(Total 8 marks)